

## CURRICULUM VITAE

**Name:** Jonathan R. Lai

### **Contact Information:**

Department of Biochemistry  
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### **Education:**

1999 – 2004      Ph. D., Biophysics, University of Wisconsin, Madison, WI, USA  
*Advisor: Samuel H. Gellman, Dept. of Chemistry*  
*Thesis: Structure and Function of Peptide Oligomers with Natural and Non-Natural Backbones*

1995 – 1999      B. Sc. (Hons.), Biochemistry, Queen's University, Kingston, ON, Canada

### **Post-graduate Training:**

2007              Post-Doctoral Fellow  
Dept. of Biological Chemistry and Molecular Pharmacology  
Harvard Medical School, Boston, MA, USA  
*Advisor: Stephen C. Harrison*

2004 – 2007      Helen Hay Whitney Post-Doctoral Fellow  
Dept. of Biological Chemistry and Molecular Pharmacology  
Harvard Medical School, Boston, MA, USA  
*Advisor: Christopher T. Walsh*

### **Professional Employment:**

2018 – present      Professor (with Tenure)  
2013 – 2018      Associate Professor  
2007 – 2013      Assistant Professor  
Department of Biochemistry  
Albert Einstein College of Medicine, Bronx, NY, USA

### **Professional Society Memberships:**

American Chemical Society (2002 – present)  
American Association for the Advancement of Science (2006 – present)  
New York Academy of Sciences (2010 – present)  
American Peptide Society (2010 – present)  
The Antibody Society (2013 – present)

The Protein Society (2014 – present)  
American Society for Virology (2015 – present)

### Awards and Honors:

2015 – 2020	Irma T. Hirschl/Monique Weill-Caulier Career Scientist Award
2009 – 2012	Arnold and Mabel Beckman Young Investigator Award
2004 – 2007	Helen Hay Whitney Postdoctoral Fellowship
2002 – 2004	Natural Sciences and Engineering Research Council of Canada PGS B Scholarship
1995 – 1997	Queen’s University Honor Matriculation Scholarship

### Peer-Reviewed Articles:

*From the Albert Einstein College of Medicine (\* Corresponding Author(s))*

56. Quiroz, J. A.; Malonis, R. J.; Thackray, L. B.; Cohen, C. A.; Pallesen, J.; Jangra, R. K.; Brown, R. S.; Hofmann, D.; Holtsberg, F. W.; Shulenin, S.; Nyakatura, E. K.; Rayannavar, V.; Daily, J. P.; Ward, A. B.; Aman, M. J.; Dye, J. M.; Chandran, K.; Diamond, M. S.; Kielian, M.; **Lai, J. R.\*** Isolation and Characterization of Neutralizing Human Monoclonal Antibodies against Chikungunya Virus that Protect against Disease. *Submitted*.
55. Dai, Z.; **Lai, J. R.\*** Isolation of Synthetic Antibodies Against BCL2-Associated X Protein (BAX). *Methods Mol. Biol.*, **2019**, 1877, 351-357.
54. Jangra, R. K.; Herbert, A. S.; Li, R.; Jae, L. T.; Kleinfelter, L. M.; Slough, M. M.; Barker, S. L.; Guardado-Calvo, P.; Román-Sosa, G.; Dieterle, M. E.; Kuehne, A. I.; Muenz, N. A.; Wirchnianski, A. S.; Nyakatura, E. K.; Fels, J. M.; Ng, M.; Mittler, E.; Pan, J.; Bharrhan, S.; Wec, A. Z.; **Lai, J. R.**, Sidhu, S. S.; Tischler, N. D.; Rey, F. A.; Moffat, J.; Brummelkamp, T. R.\*; Wang, Z.\*; Dye, J. M.\*; Chandran, K.\* Protocadherin-1 Is Essential for Cell Entry by New-World hantaviruses. *Nature*, **2019**, 563, 559-563..
53. Saphire, E. O.\*; Schendel, S. L.; Fusco, M. L.; Gangavarapu, K.; Gunn, B. M.; Wec, A. Z.; Halfmann, P. J.; Brannan, J. M.; Herbert, A. S.; Qiu, X.; Wagh, K.; He, S.; Giorgi, E. E.; Theiler, J.; Pommert, K. B. J.; Krause, T. B.; Turner, H. L.; Murin, C. D.; Pallesen, J.; Davidson, E.; Ahmed, R.; Aman, M. J.; Bukreyev, A.; Burton, D. R.; Crowe, J. E. Jr; Davis, C. W.; Georgiou, G.; Krammer, F.; Kyrtatous, C. A.; **Lai, J. R.**; Nykiforuk, C.; Pauly, M. H.; Rijal, P.; Takada, A.; Townsend, A. R.; Volchkov, V.; Walker, L. M.; Wang, C. I.; Zeitlin, L.; Doranz, B. J.; Ward, A. B.; Korber, B.; Kobinger, G. P.\*; Andersen, K. G.\*; Kawaoka, Y.\*; Alter, G.\*; Chandran, K.\*; Dye, J. M.\*; Viral Hemorrhagic Fever Immunotherapeutic Consortium. Systematic Analysis of Monoclonal Antibodies against Ebola Virus GP Defines Features that Contribute to Protection. *Cell*, **2018**, 174, 938-952.
52. Gunn, B. M.; Yu, W. H.; Karim, M. M.; Brannan, J. M.; Herbert, A. S.; Wec, A.Z.; Halfmann, P. J.; Fusco, M. L.; Schendel, S. L.; Gangavarapu, K.; Krause, T.; Qiu, X.; He, S.; Das, J.; Suscovich, T. J.; **Lai, J.**; Chandran, K.; Zeitlin, L.; Crowe, J. E. Jr; Lauffenburger, D.; Kawaoka, Y.; Kobinger, G. P.; Andersen, K. G.; Dye, J. M.; Saphire, E. O.\*; Alter, G.\* A Role for Fc Function in Therapeutic Monoclonal Antibody-Mediated Protection against Ebola Virus. *Cell Host Microbe*, **2018**, 24, 221-233.
51. Frei, J. C.; Wirchnianski, A. S.; Govero, J.; Vergnolle, O.; Dowd, K. A.; Pierson, T. C.; Kielian, M.; Girvin, M. E.; Diamond, M. S.; **Lai, J. R.\*** Engineered Dengue Virus Domain III Proteins Elicit Cross-Neutralizing Antibody Response in Mice. *J. Virol.* **2018**, 92, pii: e01023-18.

50. Nyakatura, E. K., Zak, S. E., Wec, A. Z., Hofmann, D., Shulenin, S., Bakken, R. R., Aman, M. J., Chandran, K., Dye, J. M., **Lai, J. R.**\* Design and Evaluation of Bi- and Trispecific Antibodies Targeting Multiple Filovirus Glycoproteins. *J. Biol. Chem.* **2018**, *293*, 6201-6211.
49. Lin, T. Y.; **Lai, J. R.**\* Interrogation of Side Chain Biases for Oligomannose Recognition in Antibody 2G12 via Structure-Guided Phage Display Libraries. *Bioorg. Med. Chem.* **2017**, *25*, 5790-5798.
48. Hofmann, D. H.; Zak, S. E.; Nyakatura, E. K.; Mittler, E.; Bakken, R. R.; Chandran, K.; Dye, J. M.; **Lai, J. R.**\* Mechanistic and Fc Requirements for Inhibition of Sudan Virus Entry and In Vivo Protection by a Synthetic Antibody. *Immunol. Lett.*, **2017**, *190*, 289-295.
47. Wec, A. Z.; Herbert, A. S.; Murin, C. D.; Nyakatura, E. K.; Abelson, D. M.; Fels, J. M.; He, S.; James, R. M.; de La Vega, M. A.; Zhu, W.; Bakken, R. R.; Goodwin, E.; Turner, H. L.; Jangra, R. K.; Zeitlin, L.; Qiu, X.; **Lai, J. R.**; Walker, L. M.; Ward, A. B.; Dye, J. M.\*; Chandran, K.\*; Bornholdt, Z. A.\* Antibodies from a Human Survivor Define Sites of Vulnerability for Broad Protection against Ebolaviruses. *Cell*, **2017**, *169*, 878-890.
46. Hofmann, D.; **Lai, J. R.**\* Exploring Human Antimicrobial Antibody Responses on a Single B Cell Level. *Clin. Vaccine Immunol.*, **2017**, *24*, pii: e00544-16.
45. Nyakatura, E. K.; Soare, A. Y.; **Lai, J. R.**\* Bispecific Antibodies for Viral Immunotherapy. *Hum. Vaccin. Immunother.*, **2017**, *13*, 836-842.
44. Wec, A. Z.; Nyakatura, E. K.; Herbert, A. S.; Howell, K. A.; Holtsberg, F. W.; Bakken, R. R.; Mittler, E.; Christin, J. R.; Shulenin, S.; Jangra, R. K.; Bharrhan, S.; Kuehne, A. I.; Bornholdt, Z. A.; Flyak, A. I.; Saphire, E. O.; Crowe, J. E. Jr\*, Aman, M. J.\*; Dye, J. M.\*; **Lai, J. R.**\*, Chandran K.\* A "Trojan horse" bispecific antibody strategy for broad protection against ebolaviruses. *Science*, **2016**, *354*, 350-354.

- *Media Coverage of This Work:*

**MedPage Today:** <http://www.medpagetoday.com/infectiousdisease/ebola/60105>

**Reuters:** <http://in.reuters.com/article/health-ebola-idINKCN11E2LE?il=0>

**Yahoo News:** <https://www.yahoo.com/news/trojan-horse-antibody-strategy-shows-promise-against-ebola-180000454.html>

**Voice of America:** <http://www.voanews.com/a/trojan-horse-antibody-strategy-promise-against-ebola/3499928.html>

**Science Daily:** <https://www.sciencedaily.com/releases/2016/09/160908142112.htm>

**First Word Pharma:** <https://www.firstwordpharma.com/node/1414704?tsid=17>

**Infection Control Today:** <http://www.infectioncontroltoday.com/news/2016/09/new-trojan-horse-antibody-strategy-shows-promise-against-all-ebola-viruses.aspx>

**Health Medicine Network:** <http://healthmedicinet.com/new-trojan-horse-antibody-strategy-shows-promise-against-all-ebola-viruses/>

**Lab Manager Magazine:** <http://www.labmanager.com/news/2016/09/ebola-research-new-trojan-horse-antibody-strategy-shows-promise-against-all-ebola-viruses?fw1pk=2#.V-6oAfrKUK>

**Medical Xpress:** <http://medicalxpress.com/news/2016-09-trojan-horse-antibody-strategy-ebola.html>

**MedPage Today:** <http://www.medpagetoday.com/infectiousdisease/ebola/60105>

**SciFeeds:** <https://scifeeds.com/news/new-trojan-horse-antibody-strategy-shows-promise-against-all-ebola-viruses/>

**Reddit:**

[https://www.reddit.com/r/science/comments/51uj8w/new\\_trojan\\_horse\\_antibody\\_strategy\\_from\\_albert/](https://www.reddit.com/r/science/comments/51uj8w/new_trojan_horse_antibody_strategy_from_albert/)

43. Frei, J. C.; **Lai, J. R.**\* Protein and Antibody Engineering by Phage Display. *Methods Enzymol.*, **2016**, *580*, 45-87.

42. Howell, K. A.; Qiu, X.; Brannan, J. M.; Bryan, C.; Davidson, E.; Holtsberg, F. W.; Wec, A. Z.; Shulenin, A.; Biggins, J. E.; Douglas, R.; Enterlin, S. G.; Turner, H. L.; Pallesen, J.; Murin, C. D.; He, S.; Kroeker, A.; Vu, H.; Herbert, A. S.; Fusco, M. L.; Nyakatura, E. K.; **Lai, J. R.**; Keck, Z.-Y.; Fong, S. K. H.; Saphire, E. O.; Zeitlin, L.; Ward, A. B.; Chandran, K.; Doranz, B.; Kobinger, G. P.; Dye, J. M.; Aman, M. J.\* Antibody Treatment of Ebola and Sudan Virus Infection via a Uniquely Exposed Epitope within the Glycoprotein Receptor-Binding Site. *Cell Rep.* **2016**, *15*, 1514-1526.
41. Frei, J. C.; Nyakatura, E. K.; Zak, S. E.; Bakken, R. A.; Chandran, K.; Dye, J. M.\*; **Lai, J. R.\*** Bispecific Antibody Affords Complete Post-Exposure Protection of Mice from Both Ebola (Zaire) and Sudan Viruses. *Sci. Rep.*, **2016**, *6*, 19193.
- *Media Coverage of this Work:*
    - Fox News:** <http://www.foxnews.com/health/2016/01/13/scientists-make-gains-on-universal-ebola-medicine.html>
    - Yahoo News:** <http://news.yahoo.com/scientists-gains-universal-ebola-medicine-232508558.html>
    - Live Science:** <http://www.livescience.com/53353-ebola-treatment-antibodies.html>
    - STAT:** <https://www.statnews.com/2016/01/13/ebola-antibodies/>
    - NIAID:** <https://www.niaid.nih.gov/topics/ebolamarburg/Pages/default.aspx>
40. Uchime, O.; Dai, Z.; Biris, N.; Lee, D.; Sidhu, S. S.; Li, S.; **Lai, J. R.\***; Gavathiotis, E.\* Synthetic Antibodies Inhibit Bcl-2-associated X Protein (BAX) through Blockade of the N-terminal Activation Site. *J. Biol. Chem.*, **2016**, *291*, 89-102.
39. Holtsberg, F. W.; Shulenin, S.; Vu, H.; Howell, K. A.; Patel, S.; Gunn, B.; Karim, M.; **Lai, J. R.**; Frei, J. C.; Nyakatura, E.; Zeitlin, L.; Douglas, R.; Fusco, M. L.; Saphire, E. O.; Froude, J. W.; Herbert, A. S.; Wirchnianski, A. S.; Lear-Rooney, C. M.; Alter, G.; Dye, J. M.; Glass, P. J.; Warfield, K. L.; Aman, M. J.\* Pan-ebolavirus Mouse Monoclonal Antibodies: Protection against Ebola and Sudan Viruses. *J. Virol.*, **2015**, *90*, 266-278.
38. Frei, J. C.; Kielian, M.; **Lai, J. R.\*** Comprehensive Mapping of Functional Epitopes on Dengue Virus Glycoprotein E DIII for Binding to Broadly Neutralizing Antibodies 4E11 and 4E5A by Phage Display. *Virology*, **2015**, *485*, 371-382.
37. Liu, N.; Tao, Y.; Brenowitz, M. D.; Girvin, M. E.; **Lai, J. R.\*** Structural and Functional Studies on the Marburg Virus GP2 Fusion Loop. *J. Infect. Dis.*, **2015**, *212 Suppl 2: S146-153*.
36. Malashkevich, V. N.; Higgins, C. D.; Almo, S. C.\*; **Lai, J. R.\*** A Switch from Parallel to Antiparallel Strand Orientation in a Coiled-Coil X-Ray Structure via Two Core Hydrophobic Mutations. *Biopolymers: Peptide Science* **2015**, *104*, 178-185.
35. Dai, Z.; Tao, Y.; Liu, N.; Brenowitz, M. D.; Girvin, M. E.; **Lai, J. R.\*** Conditional Trimerization and Lytic Activity of HIV-1 gp41 Variants Containing the Membrane-Associated Segments. *Biochemistry* **2015**, *54*, 1589-1599.
34. Nyakatura, E. K.; Frei, J. C.; **Lai, J. R.\*** Chemical and Structural Aspects of Ebola Virus Entry Inhibitors. *ACS Infect. Dis.* **2015**, *1*, 42-52.
33. Chen, G.; Koellhoffer, J. F.; Zak, S. E.; Frei, J. C.; Liu, N.; Long, H.; Ye, W.; Nagar, K.; Pan, G.; Chandran, K.; Dye, J. M.\*; Sidhu, S. S.\*; **Lai, J. R.\*** Synthetic Antibodies with a Human Framework that Protect Mice from Lethal Sudan Ebolavirus Challenge. *ACS Chem. Biol.* **2014**, *9*, 2263-2273.
- *Media Coverage of this Work:*
    - Chemical and Engineering News:** <http://cen.acs.org/articles/92/web/2014/09/Synthetic-Antibodies-Protect-Mice-Sudan.html>
    - NY1:** [http://www.ny1.com/content/lifestyles/health\\_and\\_medicine/214115/local-researchers-work-toward-cure-for-ebola/](http://www.ny1.com/content/lifestyles/health_and_medicine/214115/local-researchers-work-toward-cure-for-ebola/)
    - NY Daily News:** <http://www.nydailynews.com/life-style/health/experts-unsure-drug-cured-americans-ebola-article-1.1912271>

**Quartz:** <http://qz.com/257467/this-treatment-may-help-in-the-fight-against-ebola-just-not-the-ebola-we-know-about/>

**Infection Control Today:** <http://www.infectioncontrolday.com/news/2014/08/drug-shows-promise-against-sudan-strain-of-ebola-in-mouse-model.aspx>

**Medscape News:** <http://www.medscape.com/viewarticle/830328>

**FrontPageAfrica:** <http://allafrica.com/stories/201408281332.html>

32. Higgins, C. D.; Malashkevich, V. N.; Almo, S. C.; **Lai, J. R.\*** Influence of a Heptad Repeat Stutter on the pH-Dependent Conformational Behavior of the Central Coiled-Coil from Influenza Hemagglutinin HA2. *Proteins*, **2014**, *82*, 2220-2228.
31. Koellhoffer, J. F.; Dai, Z.; Malashkevich, V. N.; Stenglein, M. D.; Liu, Y.; Toro, R.; Harrison, J. S.; Chandran, K.; DeRisi, J. L.; Almo, S. C.; **Lai, J. R.\*** Structural Characterization of the Glycoprotein GP2 Core Domain from the CAS Virus, a Novel Arenavirus-like Species. *J. Mol. Biol.*, **2014**, *426*, 1452-1468.
30. Koellhoffer, J. F.; Higgins, C. D.; **Lai, J. R.\*** Protein Engineering Strategies for the Development of Viral Vaccines and Immunotherapeutics. *FEBS Lett.*, **2014**, *588*, 298-307.
  - *Invited review for special issue on protein engineering.*
29. Liu, Y.; Higgins, C. D.; Overstreet, C. M.; Rai, K. R.; Chiorazzi, N.\*; **Lai, J. R.\*** Peptides that Bind Specifically to an Antibody form a Chronic Lymphocytic Leukemia Clone Expressing Unmutated Immunoglobulin Variable Region Genes. *Mol. Med.*, **2013**, *19*, 245-252.
28. Higgins, C. D.; Koellhoffer, J. F.; Chandran, K.; **Lai, J. R.\*** C-Peptide Inhibitors of Ebola Virus Glycoprotein-Mediated Cell Entry: Effects of Conjugation to Cholesterol and Side Chain-Side Chain Crosslinking *Bioorg. Med. Chem. Lett.*, **2013**, *23*, 5356-5360.
27. Harrison, J. S.\*; Higgins, C. D.; O'Meara, M. J.; Koellhoffer, J. F.; Kuhlman, B. A.; **Lai, J. R.\*** Role of Electrostatic Repulsion in Controlling pH-Dependent Conformational Changes of Viral Fusion Proteins *Structure*, **2013**, *21*, 1085-1096.
  - *Most Downloaded Article in Structure for Month of July 2013*
26. Regula, L. K.; Harris, R.; Wang, F.; Higgins, C. D.; Koellhoffer, J. F.; Zhao, Y.; Chandran, K.; Gao, J.; Girvin, M. E.; **Lai, J. R.\*** Conformational Behavior of Peptides Corresponding to the Ebolavirus GP2 Membrane-Proximal External Region in the Presence of Micelle-Forming Surfactants and Lipids. *Biochemistry*, **2013**, *52*, 3393-3404.
25. Stewart, A.; Harrison, J. S.; Regula, L. K.; **Lai, J. R.\*** Side Chain Requirements for Affinity and Specificity in D5, an HIV-1 Antibody Derived from the VH1-69 Germline Segment. *BMC Biochemistry*, **2013**, *14*, 9.
24. Koellhoffer, J. K.; Chen, G.; Sandesara, R.G.; Bale, S.; Sapphire, E. O.; Chandran, K.\*; Sidhu, S. S.\*; **Lai, J. R.\*** Two Synthetic Antibodies that Recognize and Neutralize Distinct Proteolytic Forms of the Ebola Virus Glycoprotein. *ChemBioChem*, **2012**, *13*, 2549-2557.
23. Koellhoffer, J. K.; Malashkevich, V. N.; Harrison, J. S.; Toro, R.; Bhosle, R. C.; Chandran, K.; Almo, S. C.; **Lai, J. R.\*** Crystal Structure of the Marburg Virus GP2 Core Domain in its Post-Fusion Conformation. *Biochemistry*, **2012**, *51*, 7665-7675.
  - *Biochemistry Highlighted Article*
22. Harrison, J. S.; Koellhoffer, J. K.; Chandran, K.; **Lai, J. R.\*** Marburg Virus Glycoprotein GP2: pH-Dependent Stability of the Ectodomain  $\alpha$ -Helical Bundle. *Biochemistry*, **2012**, *51*, 2515-2525.
21. Stewart, A.; Liu, Y.; **Lai, J. R.\*** A Strategy for Phage Display Selection of Functional Domain-Exchanged Immunoglobulin Scaffolds with High Affinity for Glycan Targets. *J. Immunol. Methods*, **2012**, *376*, 150-155.
20. Liu, Y.; Regula, L. K.; Stewart, A.; **Lai, J. R.\*** Synthetic Fab Fragments that Bind the HIV-1 Heptad Repeat Regions. *Biochem. Biophys. Res. Commun.*, **2011**, *413*, 611-615.

19. Harrison, J. S.; Higgins, C. D.; Chandran, K.; **Lai, J. R.\*** Designed Protein Mimics of the Ebola Virus Glycoprotein GP2  $\alpha$ -Helical Bundle: Stability and pH Effects. *Protein Sci.*, **2011**, *20*, 1587–1596.
18. Miller, E. H.; Harrison, J. S.; Radoshitzky, S. R.; Higgins, C. D.; Chi, X.; Dong, L.; Kuhn, J. H.; Bavari, S.; **Lai, J. R.\***; Chandran, K.\* Inhibition of Ebola Virus Entry by a C-Peptide Targeted to Endosomes. *J. Biol. Chem.*, **2011**, *286*, 15854–15861.
  - *Highlighted in Chemical and Engineering News: “Peptide Denies Cell Entry to Ebola Virus” 2011*, *89(16)*, 35-36.
17. Da Silva, G. F.; Harrison, J. S.; **Lai, J. R.\*** Contribution of Light Chain Residues to High Affinity Binding in an HIV-1 Antibody Explored by Combinatorial Scanning Mutagenesis. *Biochemistry*, **2010**, *49*, 5464–5472.

From Graduate and Post-Doctoral Work

16. Pomerantz, W. C.; Grygiel, T. L. R.; **Lai, J. R.**; Gellman, S. H. Distinctive Circular Dichroism Signature for 14-Helix-Bundle Formation by  $\beta$ -Peptides. *Org. Lett.* **2008**, *10*, 1799–1802.
15. Fischbach, M. A.; **Lai, J. R.**; Roche, E. D.; Walsh, C. T.; Liu, D. R. Directed Evolution Can Rapidly Improve the Activity of Chimeric Assembly-Line Enzymes. *Proc. Natl. Acad. Sci. USA*. **2007**, *104*, 11951–11956.
14. Zhou, Z.; **Lai, J. R.**; Walsh, C. T. Directed Evolution of Aryl Carrier Proteins: Determinants of Recognition in the Enterobactin Synthetase. *Proc. Natl. Acad. Sci. USA*. **2007**, *104*, 11621–11626.
13. **Lai, J. R.**; Koglin, A.; Walsh, C. T. Carrier Protein Structure and Recognition in Polyketide and Nonribosomal Peptide Biosynthesis. *Biochemistry*. **2006**, *45*, 14869–14879.
12. **Lai, J. R.**; Fischbach, M. A.; Liu, D. R.; Walsh, C. T. Localized Protein Interaction Surfaces on the EntB Carrier Protein Revealed by Combinatorial Mutagenesis and Selection. *J. Am. Chem. Soc.* **2006**, *128*, 11002–11003.
11. Zhou, Z.; **Lai, J. R.**; Walsh, C. T. Interdomain Communication Involving the Thiolation Domain of EntF Explored by Combinatorial Mutagenesis and Selection. *Chem. Biol.* **2006**, *13*, 869–879.
10. **Lai, J. R.**; Fischbach, M. A.; Liu, D. R.; Walsh, C. T. A Protein Interaction Surface in Nonribosomal Peptide Synthesis Mapped by Combinatorial Mutagenesis and Selection. *Proc. Natl. Acad. Sci. USA* **2006**, *103*, 5314–5319.
9. **Lai, J. R.**; Eband, R. F.; Weisblum, B.; Eband, R. M.; Gellman, S. H. Role of Salt and Conformation in the Biological and Physicochemical Behavior of Protegrin-1 and Designed Analogues: Correlation of Antimicrobial, Hemolytic and Lipid Bilayer-Perturbing Activities. (Equal contributors) *Biochemistry*. **2006**, *45*, 15718–15730.
8. **Lai, J. R.**; Fisk, J. D.; Weisblum, B.; Gellman, S. H. Hydrophobic Core Repacking in a Coiled-Coil Dimer via Phage Display: Insights into Plasticity and Specificity at a Protein-Protein Interface. *J. Am. Chem. Soc.* **2004**, *126*, 10514–10515.
7. Park, J. S.; Lee, H. S.; **Lai, J. R.**; Kim, B. M.; Gellman, S. H. Accommodation of  $\alpha$ -Substituted Residues in the  $\beta$ -Peptide 12-Helix: Expanding the Range of Substitution Patterns Available to a Foldamer Scaffold. *J. Am. Chem. Soc.* **2003**, *125*, 8539–8545.
6. Raguse, T. L.; **Lai, J. R.**; Gellman, S. H. Environment-Independent 14-Helix Formation in Short  $\beta$ -Peptides: Striking a Balance between Shape Control and Functional Diversity. *J. Am. Chem. Soc.* **2003**, *125*, 5592–5593.
5. **Lai, J. R.**; Gellman, S. H. Reinvestigation of the Proposed Folding and Self-Association of the Neuropeptide Head Activator. *Protein Sci.* **2003**, *12*, 560–566.
4. Raguse, T. L.; **Lai, J. R.**; Gellman, S. H. Evidence that the  $\beta$ -Peptide 14-Helix is Stabilized by  $\beta^1$ -Residues with Side-Chain Branching Adjacent to the  $\beta$ -Carbon. *Helv. Chim. Acta* **2002**, *85*, 4154–4164.

3. **Lai, J. R.**; Huck, B. R.; Weisblum, B.; Gellman, S. H. Design of Non-Cysteine-Containing Antimicrobial  $\beta$ -Hairpins: Structure-Activity Relationship Studies with Linear Protegrin-1 Analogues. *Biochemistry* **2002**, *41*, 12835–12842.
2. Raguse, T. L.; **Lai, J. R.**; LePlae, P. R.; Gellman, S. H. Toward  $\beta$ -Peptide Tertiary Structure: Self-Association of an Amphiphilic 14-Helix in Aqueous Solution. *Org. Lett.* **2001**, *3*, 3963–3966.
1. Woll, M. G.; **Lai, J. R.**; Guzei, I. A.; Taylor, S. J. C.; Smith, M. E. B.; Gellman, S. H. Parallel Sheet Secondary Structure in  $\gamma$ -Peptides. *J. Am. Chem. Soc.* **2001**, *123*, 11077–11078.

#### Other Professional Activities (Partial list):

- Reviewer for (partial list) *ACS Chem. Biol.*, *Arch. Virol.*, *Biochemistry*, *Bioorg. Med. Chem. Lett.*, *Bioorg. Med. Chem.*, *BioTechniques*, *ChemBioChem*, *ChemMedChem*, *J. Am. Chem. Soc.*, *J. Mol. Biol.*, *J. Virol.*, *mBio*, *Nucl. Acids Res.*, *Proc. Natl. Acad. Sci. USA*, *Sci. Rep.*
- Elected Departmental Representative for Einstein Senate (2008 – 2011, 2013 – present)
- New York Academy of Sciences Chemical Biology Steering Committee (2010 – present)
- Sue Golding Graduate Division Admission Committee (2010 – 2014)
- NCI Study Section for Innovative Molecular Analysis Technologies: ZCA1 SRLB-Q(M1) March 2011, March 2014; ZCA1 SRLB-Q(Q1) July 2013
- Ad Hoc Reviewer: NSF Chemistry of Life Processes Program, DFG Germany (Deutsche Forschungsgemeinschaft), US-Israel Binational Science Foundation
- Medical Scientist Training Program Steering Committee (2011 – present)
- Chair, Scientific Committee of the 23<sup>rd</sup> American Peptide Symposium (2013)
- NIAID Special Emphasis Panels for HIV-1 Vaccine Innovation: ZA1 BLF-A (J2), ZA1 KP-A (J1) (2014)
- NIH SBCB Study Section Ad Hoc Reviewer (2014)
- NIH Topics in Virology Study Section: ZRG1 IDM-W (2015)
- Einstein Committee on Promotion to Associate Professor (2015 – 2017)
- Organizing Co-chair, 25<sup>th</sup> American Peptide Symposium in Whistler, BC, Canada, June 2017
- Reviewer, Arnold and Mabel Beckman Foundation (2016 – present)
- NIAID UKS-A-M2 Special Emphasis Panel (2016)
- NIH SBIR/STTR IMM-S10B Study Section (2016)
- NIAID IMM-S02M Special Emphasis Panel (2016)
- Reviewer, DoD Congressionally Directed Medical Research Programs (2016 – present)
- NIAID IMM-U90S Study Section (2017)
- NIAID ZRG1-AARR-P-57 Special Emphasis Panel (2017)
- Co-Chair, NIAID HIVRAD Study Section (2017)
- NIAID ZRG1-IDM-P-90 Special Emphasis Panel (2018)
- NIH EBIT Study Section Ad Hoc Reviewer (2018)
- NIH VMD Study Section Ad Hoc Reviewer (2018)
- NIAID ZAI1-JRR-A-S1 Special Emphasis Panel (2018)

#### Research Support:

##### Active

U19-AI109762 (PI: Sapphire, E. O.; Project 2 PI: Lai, J. R.) 3/1/2014 – 2/28/2019  
NIH/NIAID

2.4 cal mos

*Consortium for Immunotherapeutics against Viral Hemorrhagic Fevers*. Goals: To develop novel immunotherapeutics against the filoviruses and arenaviruses. This is a large consortium grant; Dr. Lai is PI for Project 2 “*Immunotherapeutic against Other Filovirus Threats*” (subcontract 8318).  
Role: Project 2 PI

Irma T. Hirschl/Monique Weill-Caulier Career Scientist Award (PI: Lai) 1/1/2016 – 12/31/2020  
*Career Scientist Award*  
Role: PI

R01-AI123654 (PI: Pirofskii, L. A.) 11/10/2016 – 10/31/2021 0.6 cal mos.  
NIH/NIAID

*Antibody Therapy for Pneumococcal Disease*. Goals: The goal of this grant is to develop antibody therapy for one type of pneumococcus, serotype 3, which portends a higher risk of death than other types. Antibody therapy will overcome roadblocks to treating this serotype, especially pneumonia in people who are at high risk for disease and do not respond well to vaccines. As a therapeutic strategy, antibody therapy will help combat antibiotic resistance.  
Role: Collaborator

R01-AI125426 (PI: Lai, J. R.) 06/01/2017 – 05/31/2021 2.4 cal mos  
NIH/NIAID

*Engineered, Multispecific Antibodies as Broad Anti-Filovirus Therapeutics*. Goals: To develop broad filovirus immunotherapies using protein engineering, and dissect their mechanisms of action.  
Role: PI

R01-AI132256 (MPIs: Chandran, K.; Lai, J. R.) 07/1/2017 – 06/30/2022 2.4 cal mos  
NIH/NIAID

*A "Trojan Horse" bispecific antibody strategy for broad filovirus therapeutics*. Goals: To develop broad filovirus immunotherapies by engineering bispecific antibodies that localize to endosomes and disrupt critical protein-protein interactions.  
Role: MPI

R42-AI122403 (MPIs: Aman, M. J.; Lai, J. R.) 07/05/2016 – 6/23/2019 1.68 cal mos  
NIH/NIAID

*Broadly Protective Bispecific Antibodies for Treatment of Ebola Virus Disease*. Goals: To develop and commercialize bispecific antibodies as novel immunotherapies against Ebola virus.  
Role: MPI

RF1-AG062296 (PI: Nowick, J. S.) 09/30/2018-06/30/2023 1.2 cal mos  
NIH/NIA

*Antibodies against Conformationally Defined Amyloid Oligomers in Alzheimer's Disease*. Goals: To identify and characterize novel mouse, rabbit, and human antibodies targeting well-defined oligomers of A $\beta$  peptides.  
Role: Collaborator

R44-AI136273 (PI: Guyre, P) 02/16/2018-01/31/2020 0 cal mos  
NIH/NIAID

*Development of CM-SVI, a Monoclonal Antibody Treatment for Sudan Virus*. Goals: To commercially develop a mAb countermeasure against Sudan Virus.  
Role: Collaborator and Consultant

## Completed

R21-AI128090 (PI: Lai, J. R.), 01/01/2017 – 12/31/2018, NIH/NIAID, *Engineered Dengue EDIIIIs as Broad Immunogens* Goals: To engineer and test novel Dengue vaccine candidates.

R01-AI090249 (PI: Lai, J. R.), 07/01/10 – 06/30/15, NIH/NIAID, *Targeting Viral Envelope Glycoproteins with Synthetic Antibodies*.

R21-CA155472 (PI: Lai, J. R.), 07/01/11 – 06/30/14, NIH/NCI, *Methods to Identify High-Affinity Antibodies that Target Tumor-Associated Glycans*.

Center for AIDS Research Pilot Project Award (PI: Lai, J.R.), 04/25/08 – 04/24/09, Einstein-Montefiore Center for AIDS Research, *Analysis of Neutralizing Antibody-Antigen Interactions in HIV-1 by Phage Display*.

Arnold and Mabel Beckman Young Investigator Award, 09/01/09 – 08/31/12, Arnold and Mabel Beckman Foundation, *Synthetic Antibodies for HIV-1 Vaccines and Diagnostics Development*.

## **Selected Oral Presentations:**

- (Planned) The Protein Engineering Summit, Boston, MA, Apr. 2019
- University of Delaware, Dept. of Chemistry and Biochemistry, Newark, DE, Jan. 2019
- World Bispecific Summit, Boston MA, Sept 2018
- Peptides Gordon Research Conference, Ventura CA, Feb. 2018
- University of North Carolina Medical School, Dept. of Biochemistry and Biophysics, Chapel Hill, NC Feb. 2018
- World Bispecific Summit, Boston, MA Sep. 2017
- CHI Peptides Discovery and Development, Boston, MA Mar. 2017
- University of Washington, Dept. of Chemistry, Seattle, WA Mar. 2017
- University of Iowa, Carver College of Medicine, Dept. of Microbiology, Iowa City, IA Feb. 2017
- Brandeis University, Dept. of Chemistry, Waltham, MA Jan. 2017
- Dartmouth College Thayer School of Engineering, Charles C. Jones Seminar, Hanover, NH Sep. 2016
- Adimab LLC, Lebanon, NH Sept. 2016
- New York Academy of Sciences Symposium on Protein Engineering, New York, NY Sep. 2016
- Georgia State University, Institute for Biomedical Research/Center for Microbial Pathogenesis, Atlanta, GA, Aug. 2016
- America's Antibody Congress, San Diego, CA, May 2016
- University of Tokyo, Tokyo, Japan, Apr. 2016
- American Chemical Society Congressional Briefing on Outbreak Preparedness, Capitol Hill, Washington, DC, Mar 2016
- Peptides Chemistry and Biology Gordon Conference, Ventura, CA, Feb 2016
- University of Pennsylvania, Biological Chemistry, Philadelphia, PA, Feb. 2016
- The Scripps Research Institute, Dept. of Chemistry, La Jolla, CA, Sept. 2015
- American Chemical Society Fall National Meeting, Boston, MA, Aug. 2015

- American Society for Virology Filovirus Workshop, London, ON, Canada, Jul. 2015
- 24<sup>th</sup> American Peptide Symposium, Orlando, FL, Jun. 2015
- The Protein Engineering Summit, Boston, MA, May 2015
- University of Delaware, Dept. of Chemistry and Biochemistry, Newark, DE, Apr. 2015
- Shanghai Tech University Institute for Advanced Immunochemical Studies, Shanghai, P.R. China, Mar. 2015
- The Protein Engineering Summit, Shanghai, P.R. China, Mar. 2015
- New York University Langone Medical Center Symposium on Biologics, New York, NY, Feb 2015
- United States Army Medical Research Institute of Infectious Diseases, Viral Immunology Branch, Fort Detrick, MD, Dec. 2014
- University of Minnesota, Dept. of Chemistry, Minneapolis, MN, Nov. 2014
- Albert Einstein College of Medicine/Montefiore Medical Center, Div. of Infectious Diseases, Bronx, NY, Nov. 2014
- Icahn School of Medicine at Mount Sinai, Dept. of Microbiology, New York, NY, Jul. 2014
- University of Massachusetts, Dept. of Chemistry, Amherst, MA, Apr. 2014
- 6<sup>th</sup> International Symposium on Filoviruses, Galveston, TX, Mar. 2014
- 14<sup>th</sup> Annual Innovative Molecular Analysis Technologies (IMAT) Meeting, NIH/NCI, Bethesda, MD, Nov. 2013
- Boston College, Dept. of Chemistry, Boston, MA, Nov. 2013
- 23<sup>rd</sup> American Peptide Symposium, Waikoloa Village, Hawaii, Jun. 2013
- Cornell University, Dept. of Chemistry and Chemical Biology, Ithaca, NY, May 2013
- The Protein Engineering Summit, Boston, MA, Apr. 2013
- University of Pittsburgh School of Medicine, Structural Biology/Molecular Biophysics, Pittsburgh, PA, Mar. 2013
- New York University, Dept. of Chemistry, New York, NY, Feb. 2013
- Johns Hopkins School of Medicine, Dept. of Molecular Pharmacology, Baltimore, MD, Feb. 2013
- University of Wisconsin, Dept. of Chemistry, Madison, WI, Oct. 2012
- University of Chicago, Dept. of Biochemistry and Molecular Biology, Chicago, IL, Oct. 2012
- Hunter College/City University of New York, Dept. of Chemistry, New York, NY, Sept. 2012
- American Chemical Society Fall National Meeting (Breakthroughs in Biochemistry), Philadelphia, PA, Aug. 2012
- Beckman Scholars/Young Investigators Symposium, Irvine, CA, Aug. 2012
- Connecticut College, Dept. of Chemistry, New London, CT, Apr. 2012
- Antibody Biology and Engineering Gordon Research Conference, Galveston, TX, Mar. 2012
- Queen's College/City University of New York, Dept. of Chemistry, New York, NY, Apr. 2011
- Feinstein Institute for Medical Research, Manhasset, NY, Mar. 2011
- The Protein Engineering Summit, Boston, MA, May 2010
- Peptides Chemistry and Biology Gordon Research Conference, Ventura, CA, Mar. 2010

## Patents

- Achkar, J.; Ishida, E.; Chen, T., **Lai, J. R.**; Hogmann, D. "Monoclonal antibodies to *Mycobacterium tuberculosis* and their potential use" United States Patent Pending.
- Lai, J. R.**; Quiroz, J. C.; Malonis, R.; Kielian, M. "Antibodies Targeting Chikungunya Virus Glycoprotein" United States Patent Pending.
- Lai, J. R.**; Frei, J. C.; Kielian, M. "Variants of Dengue Virus Glycoprotein E DIII and Uses Thereof" United States Patent Pending.

Gavathiotis, E.; **Lai, J. R.**; Sidhu, S. S. “Synthetic Antibodies to BAX and Uses Thereof” United States Patent Pending.

Chandran, K.; **Lai, J. R.**; Wec, A. Z.; Nyakatura, E. K. “Development of Antibody Therapeutics against Filoviruses” United States Patent Pending.

**Lai, J. R.**; Frei, J. C.; Nyakatura, E. K. “Multispecific Antibodies for Cross-Neutralization of Multiple Filovirus Glycoproteins” United States Patent Pending.

**Lai, J. R.**; Koellhoffer, J. F.; Frei, J. C.; Chandran, K.; Sidhu, S. S.; Chen, G.; Dye, J. M.; Zak, S. “Therapy for Filovirus Infection” United States Patent Provisional Patent Application No. 61/830,325 and U.S. Utility Application No. 14/291,608

**Lai, J. R.**; Stewart, A. “Constructs and Methods to Identify Antibodies that Target Glycans” United States Patent WO2012074863 A2, issued 06/07/12.

Liu, D. R.; Fischbach, M. A.; Walsh, C. T.; **Lai, J. R.**; Zhou, Z. “Methods of Producing Modified Assembly Lines and Related Compositions” United States Patent US20100048422 A1, issued 02/25/2010.

Gellman, S. H.; Woll, M. G.; **Lai, J. R.**; Murray, J. K. “Polypeptides Containing  $\gamma$ -Amino Acids” United States Patent US6958384 B2, issued 10/25/2005